CLAIMS

1. A method of evaluating a feature in a semiconductor wafer, the method comprising:

illuminating the wafer with a beam of electromagnetic radiation having a majority of energy polarized in a direction other than parallel to a longitudinal direction of the feature; and

measuring intensity of a portion of the beam reflected by the wafer.

2. The method of Claim 1 wherein:

the feature includes a sidewall of a groove; and

the act of measuring is performed repeatedly at a plurality of locations transverse to the longitudinal direction of the groove.

3. The method of Claim 2 wherein:

the beam has a wavelength greater than thickness of the sidewall.

4. The method of Claim 1 wherein:

the beam has a wavelength greater than a dimension of the feature; and

the beam forms on the wafer a spot of a diameter greater than the dimension.

5. The method of Claim 1 wherein:

the feature includes a trace of reflective material.

6. The method of Claim 1 wherein:

the wafer includes a layer located between a source of the beam and the feature; and

the layer is at least partially transmissive, so that the portion passes through the layer.

7. The method of Claim 1 wherein:

the beam has a majority of energy polarized in a direction at least substantially perpendicular to the longitudinal direction.

8. The method of Claim 1 wherein:

the beam has a predetermined wavelength; and

the method further comprises filtering light of a wavelength other than the predetermined wavelength.

9. The method of Claim 1 wherein the wafer has a plurality of features including the feature, and the method further comprises:

performing the act of measuring for each feature of the plurality; and

comparing measurements of multiple features.

10. The method of Claim 9 wherein:

each feature is a sidewall; and

the act of comparing includes comparing measurements of two sidewalls located opposite to one another in a groove.

11. The method of Claim 1 wherein the beam is a first beam, and the method further comprises:

illuminating the wafer with a second beam of electromagnetic radiation.

12. The method of Claim 11 wherein:

the first beam forms a first spot on the wafer, the second beam forms a second spot;

the act of measuring includes measuring with the first spot and the second spots located on opposite sides of the feature; and

the method further comprises measuring with the first spot and the second spots located on the same side of the feature.

13. The method of Claim 11 wherein:

the second spot at least partially overlaps the first spot.

14. The method of Claim 13 wherein:

the first beam has a first wavelength different from a second wavelength of the second beam;

the second beam is modulated at a predetermined frequency; and

the act of measuring includes measuring intensity of the second beam having the second wavelength and modulated at the predetermined frequency.

15. The method of Claim 13 wherein:

the first beam is polarized substantially perpendicular to the longitudinal direction.

16. A method of evaluating wafers during fabrication, the method comprising:

forming a feature of conductive material in a wafer by using at least one process parameter;

illuminating the wafer with a beam of electromagnetic radiation having a majority of energy polarized in a direction other than parallel to a longitudinal direction of the feature; and

repeatedly measuring intensity of a portion of the beam reflected by the wafer at a plurality of locations transverse to the longitudinal direction; and

changing the process parameter depending on measurements obtained from the act of repeatedly measuring.

17. The method of Claim 16 further comprising:

determining a coefficient of a function that fits the measurements;

comparing the coefficient against a predetermined limit and performing the changing based on an outcome of the comparing.

18. A method of evaluating a feature in a semiconductor wafer, the method comprising:

illuminating the wafer with two beams, each beam forming a spot; and

performing a measurement with the first spot and the second spots located on opposite sides of the feature.

19. The method of Claim 18 wherein:

each of the two beams includes unpolarized light.

20. The method of Claim 18 wherein:

each of the two beams includes light polarized in a direction other than parallel to a longitudinal direction of the feature.

21. The method of Claim 18 wherein:

the method further includes modulating intensity of a first beam at a predetermined frequency, said predetermined frequency being sufficiently small to avoid creation of a wave; and

the act of performing includes measuring intensity of a portion of the second beam reflected by the wafer, the portion being modulated at the predetermined frequency.

22. The method of Claim 18 further comprising:

performing a second measurement with the first spot and the second spots located on the same side of the feature.

23. A method of evaluating a feature in a semiconductor wafer, the method comprising:

illuminating the wafer with two beams, a first beam having a first intensity larger than a second intensity of a second beam, the first beam having a majority of energy polarized in a direction other than parallel to a longitudinal direction of the feature; and

measuring intensity of a portion of the second beam reflected by the wafer

24. The method of Claim 22 wherein:

the method further includes modulating intensity of the first beam at a predetermined frequency, said predetermined frequency being sufficiently small to avoid creation of a wave; and

the act of measuring includes measuring intensity of a portion of the second beam reflected by the wafer, the portion being modulated at the predetermined frequency.

25. The method of Claim 22 wherein:

each of the two beams is a laser beam.

26. The method of Claim 22 wherein:

the first beam is an electron beam; and

the second beam is a laser beam.

27. The method of Claim 22 wherein:

the first beam forms a first spot; and

the second beam forms a second spot that at least partially overlaps the first spot.

28. The method of Claim 22 further comprising:

forming the feature by using at least one process parameter; and

changing the process parameter depending on measurements obtained from the act of measuring.

29. An apparatus for evaluating a feature in a wafer, the apparatus comprising:

a laser source for generating a beam polarized in a direction other than parallel to a longitudinal direction of the feature; and

a photosensitive element located in a path of radiation of electromagnetic energy from the wafer.

30. The apparatus of Claim 29 further comprising:

a circuit coupled to the laser to move the beam along a line across the feature; and

a monitor for displaying a graph of a signal generated by the photosensitive element as a function of distance along the line.

31. The apparatus of Claim 30 wherein:

the line is at least substantially perpendicular to the longitudinal direction of the feature.

32. The apparatus of Claim 29 further comprising:

an oscillator capable of oscillating at a frequency lower than 25000 Hz, the oscillator being coupled to the laser source; and

a lock-in amplifier coupled to said oscillator and to said photosensitive element.

33. The apparatus of Claim 32 wherein during operation:

said oscillator causes said laser source to generate said beam at an intensity modulated at said frequency; and

said lock-in amplifier generates a signal indicative of reflectivity of said wafer.

34. The apparatus of Claim 29 further comprising:

a computer coupled to the photosensitive element and programmed to determine a dimension of the feature.

35. The apparatus of Claim 34 further comprising:

a memory having encoded therein values generated from at least one test wafer having a feature of a known property;

wherein the computer is programmed to use a signal generated by the photosensitive element to look up a value of property for the wafer, based on the values in memory.

36. An apparatus comprising:

means for illuminating a semiconductor wafer with a beam of electromagnetic radiation having a majority of energy polarized in a direction other than parallel to a longitudinal direction of the feature; and

means for measuring intensity of a portion of the beam reflected by the wafer, the means for measuring being coupled to the means for illuminating.

37. The apparatus of Claim 36 further comprising:

means for displaying measurements generated by the means for measuring, as a function of distance.